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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,717	03/16/2004	Takeshi Kijima	119113	1032

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OLIFF & BERRIDGE, PLC
P.O. BOX 320850
ALEXANDRIA, VA 22320-4850

EXAMINER	
LAFOND, RONALD D	
ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/800,717	KIJIMA ET AL.	
	Examiner	Art Unit	
	Ronald D. Lafond	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) *7 and 8* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/15/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicants' election without traverse of Claims 1 – 6 in the reply filed on October 10, 2007, is acknowledged. Claims 7 and 8 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claim Objections

2. Claim 1 is objected to because of the following informalities: it is unclear whether the phrase 'a heat treatment at a predetermined pressure' on Line 5 of Claim 1 ought to read 'a heat treatment at a predetermined *temperature*'. See also rejections under 35 U.S.C. 112 in the following paragraphs.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 4 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Regarding these Claims, both Claims refer back to Claim 1 and refer to the 'predetermined temperature,' which currently has antecedent basis in Claim 1 only in regard to the gas that is supplied to the chamber. It is not clear in Claim 1 if the predetermined temperature of the gas supplied to the chamber is equal to the temperature that the heat treatment of the treatment target is supposed to take place/start at. In regards to Claims 4 and 6, while both refer to the same 'predetermined temperature,' Claim 4 appears to refer to a temperature rise rate (in accordance with a rapid thermal annealing method of Claim 2) *from* a predetermined starting temperature, while Claim 6 appears to refer to a starting temperature (of 200 C of less). Moreover, Applicants do not discuss in the Specification the idea of heating the substrate to a temperature of 200 C or less at a ramp rate of 50 C/sec or more. For the purposes of compact prosecution, the Examiner will interpret Claim 4 to read "wherein the treatment target is heated *from* the predetermined temperature at a temperature rise rate of 50 C/sec or more" (in Accordance with the written description provided on Page 11, lines 18 – 27, and Page 12, lines 1 – 10 of

the Specification) and will interpret Claim 6 to read "wherein the predetermined temperature that the gas is supplied to the chamber at is 200 C or less."

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1 – 3, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natori, et al. (United States Patent Application Publication US 2003/0020157 A1, hereafter Natori) in view of Wu (United States Patent 6,393,210 B1).

8. Regarding Claim 1, Natori teaches a method of manufacturing a ceramic film (see Paragraphs [0005] – [0009]), comprising: providing a treatment target in which a raw material body including a complex oxide is applied to a substrate (see, e.g., Paragraphs [0061] – [0070], Paragraphs [0281] – [0283] and [0328] – [0330], Paragraphs [0336] – [0339], and Claims 15, 16, and 17); and crystallizing the raw material body by holding the treatment target in a chamber and subjecting the treatment target to a heat treatment at a predetermined pressure in a gas which is pressurized at two atmospheres or more and includes at least an oxidizing gas (see, e.g., Paragraphs [0272], [0273], and especially [0275]).

9. Natori does not explicitly teach the method wherein the gas is supplied to the chamber after being heated to a predetermined temperature in advance. However, Wu teaches just such a limitation in the heat treatment of semiconductor substrates. Specifically, Wu teaches, in Column 5, lines 7 – 20, that "the method and apparatus of this invention can be used in many different heat treatment applications in which a gas composition is employed to flow through the object being treated ... The method can ... be used in the thermal annealing of ion or dopant implanted semiconductor wafer, sintering metal contacts to enhance the metal-semiconductor contact after the deposition of metal film, ... and the like." Wu further teaches, in Column 6, lines 25 – 46, that "the preheat unit preheats a gas composition used in the thermal processing of a wafer in the reactor. Gas compositions useful in the thermal processing of wafers are

generally known in the art ... In a rapid thermal oxidation process, a gas composition having oxygen optionally in admixture with an inert gas is used." Wu also teaches, in Column 3, lines 9 – 31, that "in accordance with the present invention, the gas composition is preheated before it is flushed into the rapid thermal processing chamber. Typically, the gas composition is heated to a preheat temperature that is sufficiently close to the operating temperature of the thermal processing chamber such that when the gas composition reaches the wafer being treated, its temperature is substantially same as the operating temperature. Preferably, the gas composition is preheated to the operating temperature before it flows into the processing chamber. Because the difference between the entering gas temperature and the operating temperature in a processing chamber is drastically reduced or even eliminated, when the gas composition flows into the processing chamber, it will not absorb any substantial amount of heat from the outer edge of the wafer being processed. Thus, the interference with the temperature uniformity on the wafer surface by the entering gas composition is minimized." Finally, Wu teaches, in Column 4, lines 9 – 13, that "by preheating the gas composition, the present invention significantly reduces the temperature difference, and improves the temperature uniformity on the wafer surface. As a result, less dislocation and distortion in the processed wafer is caused, and wafers with better qualities can be produced." Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori by supplying the oxygen-containing sintering/annealing gas to the crystallizing/heat treatment chamber heated to the pre-determined process temperature in advance as taught by Wu, because Wu teaches that utilizing such a procedure results in improved temperature uniformity across the substrate and results in wafers/substrates with improved performance.

10. Regarding Claim 2, Natori teaches that the heat treatment is performed by using a rapid thermal annealing method (see Paragraphs [0342] and [0374]). In the alternative, Natori in view of Wu does not explicitly teach that the rapid thermal annealing takes place at pressures of two atmospheres or more. However, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori by utilizing a heat treatment that is performed by using a rapid thermal annealing method in a gas which is pressurized at two atmospheres or more with a

reasonable expectation of success, because Natori teaches that the heat treatment may be an annealing method performed in a pressurized, oxidizing atmosphere of 2 atmospheres or more and that the heat treatment may be a rapid thermal annealing method performed in an oxidizing atmosphere.

11. Regarding Claim 3, Natori does not explicitly teach the method wherein a capacity of the chamber is 100 times or less of a volume of the substrate. However, both Natori (in Figure 22) and especially Wu (in Figures 1 and 2) show reactor chambers that are obviously less than 100 times the volume of the substrate. While these drawings are not necessarily to scale, it is the Examiner's position that the scales employed in these Figures would have reasonably indicated to one having ordinary skill in the art that reactors with volumes on the same order of magnitude as the volume of the wafer are typically employed. Moreover, Wu explicitly teaches, in Column 5, lines 28 – 30, that "conventional RTP reactors which generally process only one wafer at a time can be used." Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori in view of Wu by utilizing a chamber having a capacity that is less than 100 times a volume of the substrate, because both Natori and Wu teach that such reactor sizes are typically employed in the art, and because reactor size is a known variable in process design and because minimizing process costs and reactor size are well known objectives of process design.

12. Regarding Claim 6, Natori in view of Wu does not explicitly teach the method wherein the predetermined temperature that the gas is supplied to the chamber at is 200 C or less. However, Natori does teach, in Paragraphs [0336] – [0343], that substrate treatment, ceramic raw material liquid application, and solvent evaporation takes place at temperatures that are less than 200 C (e.g., 180 C for substrate surface treatment in Paragraph [0338], and 160 C for solvent evaporation in Paragraph [0340]). Natori further teaches that crystallizing heat treatment takes place after these steps. As discussed for Claim 1, Wu teaches that it is known in the art to supply fluid streams to a unit operation at the temperature at which a process is taking place in order to more fully control the reaction or process. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori in view of Wu by supplying the gas at a pre-heated temperature of 200 C or less, because Wu teaches that it is known to pre-heat fluid streams to a

process temperature, and because Natori teaches that the steps immediately preceding the crystallizing heat treatment occur at temperatures less than 200 C.

13. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Natori in view of Wu, and further in view of Cuchiaro, et al. (United States Patent 6,225,156 B1, hereafter Cuchiaro). Natori and Wu are cited for the same reasons discussed above, which are incorporated herein.

14. Regarding these Claims, Natori teaches the concept of rapid thermal annealing (RTA) (see Paragraphs [0342] and [0374]), but does not teach the method wherein the treatment target is heated from the predetermined temperature at a temperature rise rate of 50 C/sec or more. However, Cuchiaro teaches just such limitations, wherein "a ferroelectric coating [is] crystallized using rapid-thermal processing, sometimes referred to as rapid-thermal-annealing (RTA) in which the wafer ... [is] raised to temperature at a rate of 100 C/sec" (see Column 12, lines 29 – 32). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the present invention to have modified the method taught by Natori by utilizing a heat treatment using a rapid thermal annealing method in which the treatment target is heated from the predetermined temperature at a temperature rise rate of 50 C/sec or more as taught by Cuchiaro, because Cuchiaro teaches that it is known in the art to form ceramic films including complex oxides by performing crystallization via RTA with temperature ramp rates of 100 C/sec.

15. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Natori in view of Wu, and further in view of Rubey, et al. (United States Patent 5,846,293, hereafter Rubey).

16. Regarding Claim 5, Natori does not teach the method wherein pressure of the gas in the chamber is increased to the predetermined pressure of two atmospheres or more within 60 seconds. However, Rubey teaches that it is known in the art to achieve near instantaneous pressure changes in small reactor volumes. Rubey teaches, in Column 5, lines 27 – 45, that "After the sample has been admitted ... the rapid actuation switching valve is switched to high pressure gas source such that the sample receives a substantially instantaneous step-increase in pressurization to about 8.0 absolute atmospheres. By "step-increased pressurization", it is meant that substantially instantaneous increase in pressure occurs from a low (but positive) pressure to a substantially higher pressure in a short amount of time (about 30 milliseconds)." Therefore, it would have been obvious to one having ordinary skill in the art at the time of

the present invention to have modified the method taught by Natori in view of Wu by increasing the pressure of the gas in the chamber during heat treatment to the predetermined pressure of two atmospheres or more within 60 seconds as taught by Rubey, because Rubey teaches that is known to achieve such pressure increases in very short times via normal process design and because it is known in the art to control pressures and to minimize processing times.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ronald D. Lafond whose telephone number is (571) 270-1878. The examiner can normally be reached on M - F, 9:30 AM - 6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RDL

FRED J. PARKER
PRIMARY EXAMINER